

Appendix D

Engineering Design File for the Haul Road Trade-Off Study

Engineering Design File

WAG 5 Haul Road Trade-Off Study

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

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1. Project File No. _____ 2. Project/Task WAG 5 Haul Road Trade-Off Study

3. Subtask Trade-Off Study

4. Title: WAG 5 Haul Road Trade-Off Study

5. Summary: This Engineering Design File (EDF) contains the WAG 5 Haul Road Trade-Off Study and haul road route recommendation. The purpose of this study is to determine which route should be used to haul contaminated soil from Waste Area Group 5 (WAG 5) on the Idaho National Engineering and Environmental Laboratory (INEEL) to the proposed INEEL CERCLA Disposal Facility (ICDF).

Conclusion:

Two haul routes were evaluated. Route #1 utilized existing INEEL roads (via Wilson Boulevard and Jefferson Road to East Portland Avenue then onto Lincoln Boulevard.) and Route #2 proposed to construct a more direct path across the desert to the ICDF from the ARA/PBF areas. Four main areas were then used to compare and to determine the most economical and safe route. The criterion consisted of: Exposure/Safety Impacts, Environmental Impacts, Construction and Soil Transport Costs, and Future Use.

Exposure/Safety Impacts:

Route #1 (using existing roads) and Route #2 (constructing a new road) both had a risk ranking of moderate risk and both routes would require the same transport plan. Route #1 would require limited haul times during peak traffic hours to decrease exposure to INEEL and other on-site personnel, where Route #2 would not have any haul time restrictions. However, Route #2 would have increased safety risks due to the proposed two-lane and gravel surface design.

Environmental Impacts:

Route #1 would have no archaeological impacts. Route #2 would require archaeological mitigation at an approximate cost of \$86,400.

Construction and Soil Treatment Costs:

Route #1 would have no construction and the soil transport costs would be \$100,500. Route #2 would have a construction cost of approximately \$1.5M and a soil transport of \$88,000.

Future Use:

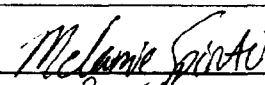

This criteria is not applicable to Route #1. Approximately 7,000 cubic yards of additional debris will be sent to the ICDF from future PBF D&D. No costs were estimated for the future value of a new haul road, Route #2, for the transport of this material.

The total costs associated with safety impacts, environmental impacts, construction of a new haul road, and hauling the contaminated soil are \$121,940 for Route #1 and \$1,683,854 for Route #2. Therefore, it is recommended that Route #1 (using existing INEEL roads: Wilson Boulevard to Jefferson Road to East Portland Avenue then onto Lincoln Boulevard.) with limited haul times be used to haul WAG 5 soils from ARA/PBF to the ICDF.

6. Distribution (complete package):

Distribution (summary package only):

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

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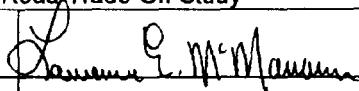
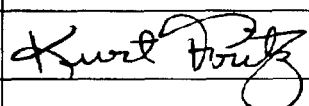
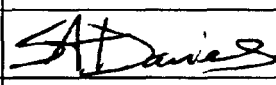
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Page 2 of 2

1. Project File No.

2. Project/Task WAG 5 Haul Road Trade-Off Study

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CONTENTS

ACRONYMS	v
1. INTRODUCTION.....	1-1
1.1 Study Purpose	1-1
1.2 Objectives	1-1
1.3 Transportation Haul Route Selection Criteria	1-1
1.3.1 Exposure/Safety Impacts.....	1-1
1.3.2 Environmental Impacts	1-2
1.3.3 Cost.....	1-2
1.3.4 Future Use	1-2
2. ALTERNATE ROUTES SELECTED FOR STUDY	2-1
2.1 Route # 1 Existing Road	2-1
2.1.1 Exposure/Safety Impact	2-1
2.1.2 Environmental Impacts	2-7
2.1.3 Cost.....	2-8
2.1.4 Future Use	2-8
2.2 Route # 2 New Road.....	2-8
2.2.1 Exposure/Safety Impact	2-8
2.2.2 Environmental Impacts	2-9
2.2.3 Cost.....	2-10
2.2.4 Future Use	2-11
3. CONCLUSION AND RECOMMENDATION	3-1
4. REFERENCES	4-1

TABLES

2-1. Qualitative measures of likelihood	2-2
2-2. Qualitative measures of consequence.....	2-2
2-3. Qualitative risk analysis matrix.....	2-3
2-4. Idaho fatal, injury, and property damage collision data, five-year history.....	2-4
2-5. Route data for haul road options.....	2-4

2-6.	Fatality, injury, and property damage projections for haul road options.	2-5
2-7.	Projected fatality, injury, and property damage projections and costs per occurrence.....	2-5
2-8.	Expected value including the increase of accidents at intersections.	2-6
3-1.	Haul road criteria comparison.	3-1
3-2.	Haul road cost comparison.....	3-2

ACRONYMS

ARA	Auxiliary Reactor Area
BBWI	Bechtel BWXT Idaho
CERCLA	Comprehensive Environmental Response, Compensation Act
CFA	Central Facilities Area
D&D	decontamination and dismantlement
DOE	Department of Energy
DOT	Department of Transportation
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LSA	low specific activity material
MCP	Management Control Procedure
NIOSH	National Institute for Occupational Safety and Health
PBF	Power Burst Facility
RCT	Radiological Control Technician
RD/RA	remedial design/remedial action
ROD	Record of Decision
SSSTF	Staging, Storing, Stabilization, and Treatment Facility
VMT	vehicle miles total
WAG	Waste Area Group
WERF	Waste Experimental Reduction Facility

WAG 5 Haul Road Trade-Off Study

1. INTRODUCTION

1.1 Study Purpose

The purpose of this study is to determine which route should be used to haul contaminated soil from Waste Area Group 5 (WAG-5) on the Idaho National Engineering and Environmental Laboratory (INEEL) to the proposed INEEL CERCLA Disposal Facility (ICDF). WAG-5 includes two main facilities, the Auxiliary Reactor Area (ARA) and the Power Burst Facility (PBF). These areas contain five contaminated soil sites in need of remediation under the WAG-5 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD). These sites include ARA-I Chemical Evaporation Pond (ARA-01), the ARA-III Radioactive Waste Leach Pond (ARA-12), ARA-I and ARA-II Radiologically Contaminated Soils (ARA-23), ARA-I Soils Beneath the ARA-626 Hot Cells (ARA-25), and the SPERT-II Leach Pond (PBF-16).

This study evaluates two routes for transporting the soil from these sites. Approximately 50,000 cubic yards of contaminated soil from WAG-5 is proposed to be disposed at the ICDF. The first alternative is to use existing roads from ARA/PBF through CFA to INTEC (via Wilson Boulevard and Jefferson Road to East Portland Avenue then onto Lincoln Boulevard). The second option is to construct a new gravel road from the ARA/PBF area across the desert to the ICDF south of INTEC. The new road would originate at the junction of Wilson Boulevard/Jefferson Road and extend in a northwesterly direction to the ICDF. (See Appendix A for layout)

1.2 Objectives

The objectives of this analysis are as follows:

- Determine exposure/safety impacts
- Determine the environmental impacts
- Determine costs associated with each option
- Determine the future use of the proposed gravel road.

1.3 Transportation Haul Route Selection Criteria

1.3.1 Exposure/Safety Impacts

The transportation haul route shall be chosen in such a manner as to minimize exposure and negative safety impacts. It is desirable to locate the road where there would be the least amount of exposure to the public and other INEEL workers, and to reduce the distance traveled. The shipment of hazardous materials within the INEEL shall comply with MCP-2669, (Hazardous Material Shipping).

1.3.2 Environmental Impacts

The route shall be located in such a manner as to minimize negative environmental impacts. Environmentally controlled or disturbed areas should be avoided. This would include ordnance areas and any cultural resources that may be encountered.

1.3.3 Cost

The life-cycle cost of constructing and operating/maintaining the road site shall be minimized. The roadway should be of suitable design and construction to accommodate heavy truck traffic throughout the design life.

1.3.4 Future Use

Consideration should be given in the life-cycle analysis to any future utility of the new haul road. Additional value may be realized during the D&D of PBF/WERF and any other future INEEL operations.

2. ALTERNATE ROUTES SELECTED FOR STUDY

Two alternatives were selected for comparison (see Appendix A for the layout). The routes selected for the study are as follows:

Route # 1. Use the existing road, which travels from the ARA/PBF area, bypassing CFA to the north, then onto INTEC (via Wilson Boulevard and Jefferson Road to East Portland Avenue then onto Lincoln Boulevard).

Route # 2. Construct a new road originating from the junction of Wilson Boulevard/Jefferson Road extending northwesterly to the proposed ICDF to be located south of INTEC.

2.1 Route # 1 Existing Road

Route #1 would originate at ARA/PBF and use existing roads to haul the contaminated soil.

2.1.1 Exposure/Safety Impact

This route is 10.5 miles and bypasses Central Facilities Area (CFA) to the north. This portion of the study addresses the following criteria for comparison:

- Risk ranking
- Potential accident occurrences and costs for each option
- Transport plan
- Junction traffic analysis.

2.1.1.1 Risk Ranking. The Rapid Risk Method is being utilized because it not only identifies the risks, as do other methods, but provides an estimate of risk levels and techniques to rank the risk levels that other available methods do not do. This technique provides a means of broad assessment and coarse ranking of safety, environmental, and business risks. This procedure also involves risk-identification and semi-quantitative risk estimation and ranking. In addition, this method is a good implementation of the Risk Management Standard AS/NZS 4360 (Standards Australia/ Standards New Zealand, 1995) and provides details for the following:

- Identification of the hazards and the consequent risks where hazard refers to something with potential to cause harm and risk refers to the harm it causes.
- A coarse estimation of the level of risk recognizing that risk is a function of both frequency of risk incident and severity of the incident's consequence. The assessment of risk is based on combining estimates of these two factors.
- Following estimates for levels of risk for identified incidents; the incidents are ranked from high to low risk to provide a means of assigning priority for risk reduction.

The Risk Management Standard Tables 2-1, 2-2, and 2-3 below are abridged versions of those in AS/NZS 4360 and illustrate the process. For each risk incident, an estimate is made of

the likelihood and consequences using Tables 2-1 and 2-2. Once the likelihood consequence scales are selected, a level of risk is defined in Table 2-3. Two things are apparent about the tables:

- The qualitative scales are imprecise and need further definition
- An implicit equivalence is defined in the consequence table between different risks; for example a medical treatment injury is considered equivalent to a high financial loss.

Within these limitations, the tables form the basis for this technique, which illustrates the features generally found as part of the Risk Ranking Method. Hazard identification is usually considered to be separate from this technique and there is no guidance on the methods to be used. Thus the existing techniques only provide part of the overall need.

The techniques described here are for industrial risk situations. This potential for very broad application of risk management principles and techniques is evident in AS/NZS 4360 which describes possible areas of impact as diverse as assets, people, timing of activities, the environment and organizational behavior.

Based on these risk ranking methods (Table 2-1), the possibility of having an accident involving one of the trucks with a passenger vehicle is considered **Unlikely**—it could occur some time, but has no greater potential by definition.

Table 2-1. Qualitative measures of likelihood.

Almost certain	Expected to occur in most circumstances
Likely	Will probably occur in most circumstances
Moderate	Should occur at some time
Unlikely	Could occur at some time
Rare	Only occur in exceptional circumstances

The qualitative measure of consequences is considered to be **Moderate** as medical treatment would be required in addition to an on-site release contained without offsite cleanup assistance and a fatality would be coupled with high financial loss capability. The consequences would not be considered Major (see Table 2-2), as there would be no offsite release expected.

Table 2-2. Qualitative measures of consequence.

Insignificant	No injuries, low financial loss
Minor	First aid treatment, on-site release immediately contained, medium financial loss
Moderate	Medical treatment required, onsite release contained without outside assistance, high financial loss
Major	Extensive injuries, loss of production capability, offsite release with no detrimental effects, major financial loss
Catastrophic	Death, toxic release offsite with detrimental effect, huge financial loss

The overall risk assessment of having an accident or fatality associated with hauling low-level waste from ARA/PBF to the ICDF is **Moderate** with an accident being **Unlikely** and the accident consequences being **Moderate** as defined in Table 2-3.

Table 2-3. Qualitative risk analysis matrix.

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	S	S	H	H	H
Likely	M	S	S	H	H
Moderate	L	M	S	H	H
Unlikely	L	L	M	S	H
Rare	L	L	M	S	S
H High risk	S Significant risk				
M Moderate risk	L Low risk				

Using this risk analysis method, the accident potential associated with the hauling of low-level contaminated soils on existing or a gravel road is relatively the same as determined by this risk ranking method.

2.1.1.2 Accident Probability Analysis/Cost Analysis per Occurrence. This study compares the use of existing paved roads from ARA/PBF to the ICDF at INTEC versus a two-lane gravel road from PBF directly to the ICDF. Differences include the round trip mileage, gravel versus paved surface, number of intersections, and controlled intersections. A controlled intersection is defined as an intersection requiring the haul truck to stop. The assumption is that there is no control of passenger vehicles with or without traffic signs.

This analysis assumes a collision would involve one haul truck and one passenger vehicle. The haul truck is assumed to have one operator and the passenger vehicle would have a maximum of two occupants. Using a worst case scenario would result in a three-person fatality in one collision event. The most recent figure for the cost of a fatality in the state of Idaho is \$2.6 M per fatality (Idaho Transportation Department, 1998). Assuming three fatalities would result in a financial loss of \$7.8M.

Idaho accident statistics from 1994 through 1998 were reviewed in great detail to extrapolate statistically reliable information to be applied to this road study.

Table 2-4. Idaho fatal injury and property damage collision data, five-year history.

	1994	1995	1996	1997	1998
Fatal collisions	219	233	228	220	224
Injury collisions	9,958	9,468	8,880	9,111	9,098
Property damage-only collisions (severity > \$750)	11,940	11,434	14,421	14,508	14,719
Vehicle miles of travel (millions)	11,652	12,297	12,924	13,112	13,644
Total fatalities	250	262	258	259	265
Fatality rate per 100 million VMT	2.1	2.1	2.0	2.0	1.9
Total injuries	17,369	16,436	14,275	14,133	13,920
Injury rate per 100 million VMT	149.3	133.7	110.5	107.8	102.0
Property damage-only rate per 100 million VMT	102.5	93.0	111.6	110.6	107.9

Table 2-5. Route data for haul road options.

Round Trip	Route #1 – Existing Road	Route #2 – New Road
# of Intersections ^a	8	2
# of Controlled Intersections ^b	4	2
Mileage/trip	21	14.5
Trips/day	84	80
Total daily mileage	1764	1160
Total haul days	28	30
<u>Total Project Mileage</u>	49,392	34,800
a. Intersection defined as any change in direction		
b. Intersection controlled with a stop sign		

The projected probability of an accident occurring is the rate per 100 million vehicle miles total of an incident × the total project mileage.

Table 2-6. Fatality, injury, and property damage projections for haul road options.

	Route #1 - Existing Road	Route #2 - New Road
Idaho fatality rate per 100 Million VMT - five year average (1994–1998)	2.02	2.02
Idaho injury rate per 100 Million VMT - five year average (1994–1998)	120.7	120.7
Idaho property–damage-only collisions (severity > \$750) Five Year Average (1994–1998)	105.1	105.1
Total project mileage	49,392	34,800
Projected fatalities for total project mileage	0.001	0.0007
Projected injuries for total project mileage	0.06	0.042
Projected property-damage-only for total project mileage	0.052	0.037

When the probability of a future event is known or may be reasonably predicted, the technique of expected value may be used. Here the probabilities are applied as the relative weights (expected value = outcome x probability). Expected value is a useful technique in projecting the long-term results when a situation occurs over and over again.

Table 2-7. Projected fatality, injury, and property damage projections and costs per occurrence.

	Route #1 - Existing Road	Route #2 - New Road
Cost per occurrence for a fatality	\$2,600,000	\$2,600,000
Cost per occurrence for an injury	\$180,000	\$180,000
Cost per occurrence property damage only	\$2,000	\$2,000
Expected value for a fatality	\$2,600	\$1,820
Expected value for an injury	\$10,800	\$7,560
Expected value for property damage only	\$104	\$74

The existing roadways have a total of eight intersections compared with the proposed gravel road having two intersections round trip travel from ARA/PBF to the ICDF. Considering an estimated 40% of accidents occur at intersections (Idaho Transportation Department, 1998), the likelihood of having an accident on existing roads would be increased. This is based on the existing roadway having four times the number of intersections compared to the proposed new haul road (8 intersections versus 2 intersections). Therefore, let us assume that a $40\% \times 4 = 160\%$ increase in the probability of having an accident.

The existing roadways are paved and the proposed haul road will be gravel. Gravel roadways have a substantial decreased stopping distance, which in turn decreases vehicle response resulting in an increased probability of having an accident on a gravel road versus a paved roadway.

Table 2-8. Expected value including the increase of accidents at intersections.

	Route #1 - Existing Road	Route #2 - New Road
Expected Value for a Fatality including 160% increase for intersections	$\$2,600 \times 1.6 = \$4,160$	\$1,820
Expected Value for an Injury including 160% increase for intersections	$\$10,800 \times 1.6 = \$17,280$	\$7,560
Expected Value for Property Damage including 160% increase for intersections	$\$104 \times 1.6 = \166	\$74

Administrative Controls

Traffic-related motor vehicle crashes are the leading cause of work related injury and deaths. Companies must rely on their regulations and their own experience when establishing safety procedures. NIOSH recommends employers take the following measures to prevent traffic-related injuries and worker deaths from motor vehicle crashes:

- Conduct haul truck drivers license checks on prospective drivers before they are hired
- Require the use of seat belts
- Ensure drivers comply with designated speed limits and signs
- Use of appropriate traffic control devices.

2.1.1.3 Transport Plan. A transport plan is developed for the onsite movement of hazardous material (generally radioactive) when it is impractical to satisfy some aspect of the DOT regulations (usually authorized packaging). Based on the radioactive contamination levels for the five sites, the soils would not be regulated in transport by DOT as radioactive material. The DOT definition of radioactive material is a specific activity greater than 70 Bq/gm (2 nCi/gm).

Adequate packaging and transport alternatives are available to ship the soils as a hazardous waste (DOT Class 9). It is not expected that the soils will meet another DOT hazard class (Class 1 through 8). With the exception of explosives, gases, and liquids, authorized DOT packaging is readily available in the unlikely event that the soils are classified other than DOT Class 9.

Should the radioactive contamination actually exceed the assumed values and the 70 Bq/gm regulated by DOT, the expected classification would likely be radioactive limited quantity or low specific activity (LSA) material. There is adequate packaging available for material under these classifications. If the actual material requires remote handling, these classifications will be revisited.

Transport Plan Summary

A transport plan is not necessary for the transport of WAG-5 contaminated soils. Adequate packaging and transport alternatives are currently available for any anticipated reasonable DOT classification. Therefore, it should not be necessary to take exception to any DOT regulation.*

2.1.1.4 Junction Traffic Analysis

Existing traffic survey data

Two previously conducted traffic surveys were evaluated for relative time-dependent traffic volumes along the evaluated routes. The first was completed in May 1998 at the intersection of E. Portland Avenue and Ogden Avenue. The other survey was completed in January 1996, and provided traffic volumes at the intersections of E. Portland with Ogden Avenue and E. Portland with Lincoln Boulevard.

The major intersections along Route 1 are: (1) at Wilson Boulevard and Jefferson Road, (2) at Jefferson Road and E. Portland Avenue, and (3) at E. Portland Avenue and Lincoln Boulevard. No existing traffic volume information for the Wilson-Jefferson intersection was found, but this is assumed relatively insignificant.

The 1996 and 1998 traffic survey data was used to create a summary chart on the second and third junctions. The summary of results is shown in Appendix B.

Traffic pattern versus construction hours

The survey traffic volume in 1996 was measured every 15 minutes. This data shows that the traffic's daily peak-hours are from 6:00 a.m. to 7:00 a.m. and from 5:00 p.m. to 6:00 p.m. The 1998 data shows hourly volumes only.

A subcontractor's normal construction operation hours are from 7:30 a.m. to 5:30 p.m., 10 hours per day, Monday through Thursday. An assumption was made that a subcontractor will be given 30 days to complete soil transport activities. More than likely the subcontractor will not work on Friday or over the weekend in order to avoid overtime costs. If the subcontractor starts to load the first truck at 7:30 a.m., the first loaded truck will reach E. Portland Avenue at 7:50 a.m. In the afternoon, the last loaded truck shall arrive the ICDF by 4:15 p.m. so the RCT can finish the Rad check by 4:30 p.m. This is necessary for the RCT to have enough time to go back to the office, change, and catch the bus by 5:20 p.m. If this schedule is followed, then the trucks will avoid the morning and afternoon peak traffic.

2.1.2 Environmental Impacts

Using the existing paved road alternative for the ARA-INTEC Haul Road will have no effect on any significant, National Register-eligible archaeological resources.

* G. K. Kanemoto, e-mail January 22, 2000

2.1.3 Cost

No new construction is required and it is assumed that road maintenance will already be accounted for. The cost associated with hauling the contaminated soil would be \$100,500. This cost was calculated based on assumptions made regarding truck loading/unloading, Rad check, and idle times experience gained during the Remedial Action of WAG-10-06 and consultation with the experienced RD/RA construction field personnel. The cost analysis is purely for comparing the use of the existing roads versus a new gravel haul road. It does not present the total soil transportation cost. See Appendix C for cost comparisons.

2.1.4 Future Use

This criterion is not applicable since the road is already in use and it is assumed that the road will remain available.

2.2 Route # 2 New Road

The construction of Route #2 would originate at the junction of Wilson Boulevard and Jefferson Road and proceed northwest to the ICDF.

2.2.1 Exposure/Safety Impact

The total length of the new road (including Wilson Boulevard) would be 7.25 miles. This section of the study will address the following criteria:

- Safety of single lane roads
- Risk ranking
- Potential accident occurrences and costs for each option
- Transport plan.

2.2.1.1 Safety of Single Lane Roads. A single lane gravel road is inherently dangerous. Twenty-one cubic yard capacity trucks have an increased travel distance for stopping. These heavy haul vehicles will face potential head-on collisions 84 times per day based on 12 trucks making 7 trips/day. This is an unacceptable risk and therefore a one-lane gravel haul road from PBF/ARA to INTEC has unacceptable risk characteristics.

According to the National Forest Service, single lane logging roads are designed for vehicle speeds between 10 MPH and 30 MPH. The road surfacing is typically crushed rock creating a soft shoulder or road edge, which can lead to frequent single vehicle rollovers. Driving on single lane gravel roads requires much slower speeds than paved roads and stopping distances are greatly increased relating to a greater accident potential, especially for large trucks.

Statistically, logging truck drivers have the second to the highest average annual fatality rates associated from motor vehicle-related accidents. These drivers have a fatality rate of 9.0 deaths per 100,000 workers second only to trucking service drivers at 12 deaths per 100,000 workers. Major contributions to logging truck drivers include the use of single lane haul roads. This information is gathered from the Bureau of Labor and Statistics (BLS 1992).

The above information categorically eliminates the possibility of constructing a new single lane haul road for the transportation of contaminated soils from PBF/ARA to the proposed ICDF at INTEC.

2.2.1.2 Risk Ranking. See Section 2.1.1.1.

2.2.1.3 Accident Probability Analysis/Cost Analysis per Occurrence. See Section

As discussed in Section 2.2.1.1, the construction of a single-lane gravel road is costly and unsafe, and is likely to result in a serious accident or fatality if used for hauling low-level contaminated soils to the ICDF. Therefore arises the question if the road was widened to become two lanes, is the cost of this road (approximately \$1.5 M) justifiable to prevent accidents on the existing paved roadways.

2.2.1.4 Transport Plan. See Section 2.1.1.3.

2.2.2 Environmental Impacts

Approximately 93 acres were intensively surveyed for cultural resources during the ARA-INTEC Haul Road survey for archaeological materials and 2.25 miles of existing two-track trail were quickly searched for archaeological materials. Prehistoric archaeological resources were found along the entire length of the proposed new construction alternative during this intensive survey, but no historic resources were observed along this route. In general, this is consistent with the results of earlier surveys in the area. A total of 10 cultural resources were recorded or re-recorded in the intensively surveyed areas. Within this total are seven archaeological sites that may be eligible for nomination to the National Register of Historic Places as well as three isolated locations that are recommended as ineligible for nomination. (see Appendix D)

Archaeological Summary

All of the archaeological resources identified within the ARA-INTEC Haul Road project area contribute to the overall base of knowledge of prehistoric human use of the northeastern Snake River Plain. The three isolates recorded during the intensive surveys and the single isolate recorded in the project area during a previous survey are unlikely to yield any information and are considered ineligible for nomination to the National Register. They are recommended for no further work and can be removed from management consideration for the Haul Road project.

In contrast, the archaeological sites identified within the proposed Haul Road corridors, including the one previously recorded during an earlier survey project, may contain additional important information in buried cultural deposits and all are evaluated as potentially eligible for nomination to the National Register. Precautionary measures must be taken to ensure that these fragile resources are not impacted if the Haul Road is constructed along the path investigated during this work.

Additional intensive archeology survey, which will be required in advance of construction if this alternative is selected, will clarify the status of sensitive areas that could also result in the identification of additional National Register-eligible resources. In that case, the new construction alternative for the Haul Road has the potential to directly impact six of the National Register-eligible sites.

If this alternative is preferred, it will be necessary to mitigate the damage that construction will cause to the sensitive archaeological sites. Mitigation can take two basic forms in this context.

- Archaeological excavation in advance of construction to catalog and preserve the important information present at each identified locality
- Modification of project plans to avoid damage to the cultural deposits.

Additional archaeological investigations will be necessary. Archaeological excavation as a form of mitigation requires considerable amounts of time and money. As a result it is often considered to be a last resort for cultural resource compliance. It is far more common to avoid adverse effects to cultural resources through slight modification of project plans. In this situation, buffer zones of approximately 20–40 meters are established around the boundaries of known sensitive resources and project plans are altered to go around the buffered areas. This could be easily accomplished and is indeed the method of mitigation proposed for the project if it proceeds. However, it will require some additional archaeological survey, particularly in those areas where the proposed road must be pushed out beyond the 60 meter-wide survey corridor to go around one of the identified archaeological sites. Unrecorded archaeological sites may be located in this unsurveyed area and they too must be protected from damage as a result of the project.

If the new construction alternative is chosen for action, the following activities are recommended for cultural resource compliance:

- All areas proposed for impact, including existing two-track trails, should be intensively resurveyed for archaeological resources.
- All identified archaeological sites subject to potential impact during construction should be revisited to establish appropriate buffer zones for protection.
- Archaeological survey coverage along the existing 60 meter-wide survey corridor should be expanded along its entire length to at least 120 meters in width. At a minimum, archaeological survey coverage must be extended in areas where plans for the new road is modified to avoid any identified archaeological sites.
- Consultation should be initiated with the State Historic Preservation Office and Shoshone-Bannock Tribes (Pace, January 2000).

2.2.3 Cost

A detailed cost estimate (Appendix E) for the construction of a single-lane gravel-surface roadway indicated such a roadway would cost approximately \$1,100,000. A single-lane gravel-surface roadway is not acceptable from a risk/safety standpoint. Therefore, a two-lane gravel-surfaced roadway is used as the basis of comparison to Route 1. The cost of a two-lane road was extrapolated from the estimate of the one-lane roadway and is estimated to be \$1,500,000. The costs associated with hauling the contaminated soil would be \$88,000. This cost was calculated based on assumptions made regarding truck loading/unloading, Rad check, and idle times experience gained during the Remedial Action of WAG-10-06 and consultation with the experienced RD/RA construction field personnel. The cost analysis is purely for comparing the

use of the existing roads versus a new gravel haul road. It does not represent the total soil transportation cost. See Appendix C for cost comparisons.

2.2.4 Future Use

The exact quantities and locations of the material that will be hauled to the ICDF is not available at the time of this study, however it is approximated that only 7,000 yd³ of additional debris will be sent to the ICDF from future PBF D&D. This represents only approximately 14% of the WAG-5 soil volume and no attempt was made in this study to estimate the future value of a new haul road for transport of this material.

3. CONCLUSION AND RECOMMENDATION

The two alternative routes to haul the contaminated soil were compared to four different criteria. These criteria were exposure/safety impacts, environmental impacts, cost, and future road use. The results and recommendations of this study are captured in the following tables.

Table 3-1. Haul road criteria comparison.

	Route #1 Existing Road	Route #2 New Road
Exposure/safety impacts Risk ranking:	The overall risk assessment of having an accident or fatality associated with hauling low-level waste from ARA/PBF to the ICDF has Moderate risk.	The overall risk assessment of having an accident or fatality associated with hauling low-level waste from ARA/PBF to the ICDF has Moderate risk.
Transport plan	A transport plan is not necessary for the transport of WAG-5 contaminated soils.	A transport plan is not necessary for the transport of WAG-5 contaminated soils.
Junction traffic analysis	The traffic's daily peak-hours are from 6:30 a.m. to 7:15 a.m. and from 4:15 p.m. to 4:45 p.m. It is assumed that the trucks will not travel during these peak hours.	Not applicable.
Safety of single lane roads	Not applicable.	A single lane gravel road is inherently dangerous. Twenty-one cubic yard capacity trucks have an increased travel distance for stopping. These heavy haul vehicles will face head-on potential collisions 84 times per day based on 12 trucks making 7 trips/day. This is an unacceptable risk and therefore a one-lane gravel haul road from PBF/ARA to INTEC has unacceptable risk characteristics.
Environmental impacts	The existing road should have no effect on any significant, National Register-eligible archaeological resources. That is as long as there are no major modifications or expansions planned for the existing roads (Jefferson Boulevard., Wilson Boulevard., E. Portland Avenue, and Lincoln Boulevard.)	If the new construction is chosen for action, the following activities are recommended for cultural resource compliance: <ul style="list-style-type: none"> • All areas proposed for impact should be intensively surveyed for archaeological resources.
		<ul style="list-style-type: none"> • All identified archaeological sites subject to potential impact during construction should be revisited to establish appropriate buffer zones for protection.
		<ul style="list-style-type: none"> • Archaeological survey coverage along the existing 60 meter-wide survey corridor should be expanded along its entire length to at least 120 meters in width. At a minimum, archaeological survey coverage must be extended in areas where plans for the new road is modified to avoid any identified archaeological sites.
		<ul style="list-style-type: none"> • Consultation should be initiated with the State Historic Preservation Office and Shoshone-Bannock Tribes.

Table 3-1. (continued)

Cost	No new construction is required and it is assumed that road maintenance will already be accounted for. The cost associated with hauling the contaminated soil would be \$100,500. This cost is purely for comparing the use of the existing roads versus a new gravel haul road. It does not present the total soil transportation cost.	The cost of constructing a new single-lane, gravel road would be \$1,100,000. It is recommended to consider using a two-lane gravel road instead for public safety reasons. The cost of a two-lane gravel road is approximately \$1,500,000. The costs associated with hauling the contaminated soil would be \$88,000. This cost is purely for comparing the use of the existing roads versus a new gravel haul road. It does not present the total soil transportation cost.
Future Use	This criterion is not applicable since the road is already in use and it is assumed that the road will remain available.	The exact quantities and locations of the material that will be hauled to the ICDF is not available at the time of this study, however it is approximated that only 7,000 yd ³ of additional debris will be sent to the ICDF from future PBF D&D. This represents only approximately 14% of the WAG-5 soil volume and no attempt was made in this study to estimate the future of a new haul road for transport of this material.

Table 3-2. Haul road cost comparison.

	Route #1 existing road costs	Route #2 new road costs
Exposure/safety impacts:		
Fatality expected value	\$4,160	\$1,820
Injury expected value	\$17,280	\$7,560
Property damage expected value	\$166	\$74
Total cost:	\$21,606	\$9,454
Environmental impacts:		
Archaeological mitigation	\$0	\$86,400
Costs:		
New road construction	N/A	\$1,500,000
Hauling the contaminated soil	\$100,500	\$88,000
TOTAL	\$121,940	\$1,683,854

Recommendation

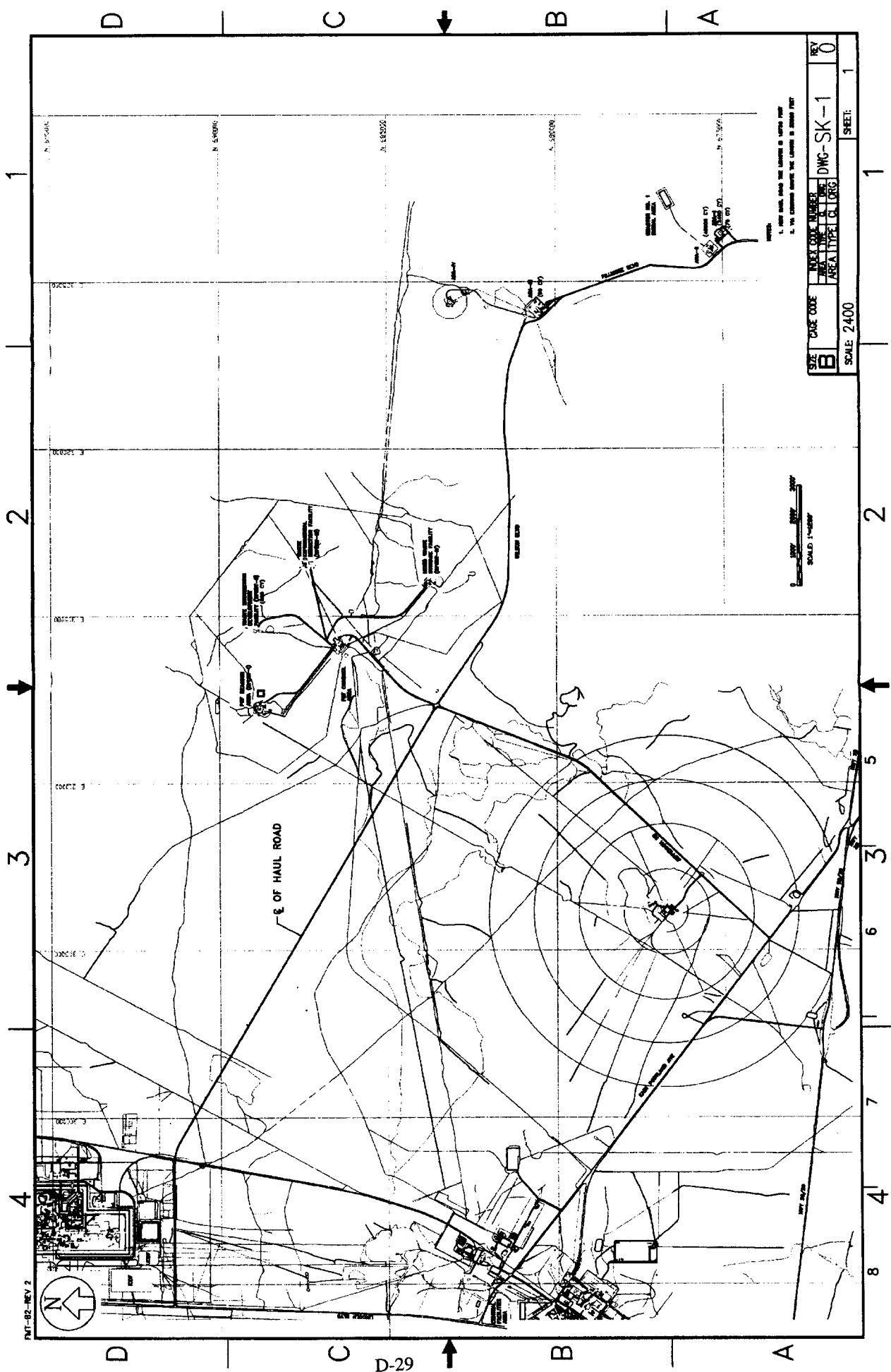
The recommended route for hauling WAG 5 soils from ARA to ICDF, based on the results of this study, is utilization of the existing roadway system and following the route: Wilson Boulevard to Jefferson Road to East Portland Avenue then onto Lincoln Boulevard.

4. REFERENCES

- Cameron, R. F., and H. M. Tweeddale, "Identifying and Ranking Major Hazards," *International Mechanical Engineering Congress*, Sydney, Australia, 8-12 July 1991.
- Gillett, J. E., "Rapid Ranking of Process Hazards," *Process Engineering*, February 1985.
- Health and Safety Organization, Victoria, Australia, "Code of Practice for Plant," July 1, 1995.
- Idaho Transportation Department, Office of Highway Safety, "1998 Idaho Traffic Collisions."
- Pace, B. R., "Cultural Resources Investigations for the Auxiliary Reactor Area – Idaho Nuclear Technology and Engineering Center Haul Road," January 2000.
- Standards Australia/ Standards New Zealand, AS/NZS 4360:1995.

Appendix A

Haul Road Layout



SIZE	CASE CODE	INDEX CODE	NUMBER	DWG-SK-1	REV
B					0
AREA	TYPE	Q	LONG		
SCALE: 2400					SHEET: 1

1. CASE CODE, AREA, TYPE, LONG, IS SHOWN FIRST
2. IN CASE CODE, AREA, TYPE, LONG, IS SHOWN FIRST

Appendix B
Summary of Results of Previous Traffic Volume Surveys

1996 and 1998 traffic survey data summary chart

DAY	TIME	May 1998 Portland/Jefferson		January 1996 Portland/Jefferson		May 1998 Portland/Lincoln		January 1996 Lincoln/Portland	
		West	East	West	East	West	East	South	North
Mon.	11:00 a.m.	56	19	45	23	30	19	61	70
Mon.	12:00 p.m.	33	18	11	34	14	18	68	69
Mon.	1:00 p.m.	25	17	15	23	13	17	54	34
Mon.	2:00 p.m.	30	26	16	27	9	26	63	44
Mon.	3:00 p.m.	31	47	16	73	24	47	93	74
Mon.	4:00 p.m.	22	117	14	101	20	117	151	37
Mon.	5:00 p.m.	10	203	2	153	17	203	237	71
Mon.	6:00 p.m.	8	20	2	17	8	20	19	8
Mon.	7:00 p.m.	10	42	1	18	12	42	27	10
Mon.	8:00 p.m.	5	8	2	11	6	8	16	1
Mon.	9:00 p.m.	0	3	0	6	0	3	8	1
Mon.	10:00 p.m.	1	1	3	0	1	1	0	1
Mon.	11:00 p.m.	10	10	4	8	10	10	7	9
Mon.	12:00 a.m.	2	15	2	19	2	15	22	3
Tues	1:00 a.m.	0	0	1	0	0	0	2	0
Tues	2:00 a.m.	0	0	1	1	0	0	3	1
Tues	3:00 a.m.	1	1	1	0	2	1	1	2
Tues	4:00 a.m.	3	0	0	0	3	0	0	0
Tues	5:00 a.m.	14	3	18	1	14	3	1	16
Tues	6:00 a.m.	190	13	151	1	124	13	11	240
Tues	7:00 a.m.	114	19	161	9	92	19	73	222
Tues	8:00 a.m.	42	10	25	8	26	10	34	58
Tues	9:00 a.m.	38	20	24	12	16	20	41	63
Tues	10:00 a.m.	43	9	33	16	23	9	49	45
Tues	11:00 a.m.	60	22	22	20	27	22	63	53
Tues	12:00 p.m.	31	24	19	33	17	24	58	61
Tues	1:00 p.m.	30	30	15	16	19	30	46	43
Tues	2:00 p.m.	21	27	19	25	7	27	64	49
Tues	3:00 p.m.	17	38	6	75	13	38	90	61
Tues	4:00 p.m.	30	121	14	104	21	121	147	31
Tues	5:00 p.m.	11	212	1	141	1	212	1	92
Tues	6:00 p.m.	9	30	4	13	8	30	5	12

1996 and 1998 traffic survey data summary chart

DAY	TIME	May 1998 Portland/Jefferson		January 1996 Portland/Jefferson		May 1998 Portland/Lincoln		January 1996 Lincoln/Portland	
		West	East	West	East	West	East	South	North
Tues	7:00 p.m.	8	42	2	16	17	42	27	13
Tues	8:00 p.m.	3	9	0	12	2	9	1	2
Tues	9:00 p.m.	2	7	0	3	1	7	1	4
Tues	10:00 p.m.	1	2	1	2	1	2	1	3
Tues	11:00 p.m.	13	12	4	6	13	12	3	10
Tues	12:00 a.m.	1	10	2	11	5	10	0	3
Wed	1:00 a.m.	0	0	1	0	0	0	4	11
Wed	2:00 a.m.	0	0	2	6	0	0	0	11
Wed	3:00 a.m.	0	0	4	0	0	0	1	3
Wed	4:00 a.m.	1	0	2	0	1	0	1	8
Wed	5:00 a.m.	36	4	14	1	33	4	1	17
Wed	6:00 a.m.	164	12	162	1	141	12	14	261
Wed	7:00 a.m.	174	21	154	14	118	21	40	239
Wed	8:00 a.m.	43	10	24	15	24	10	34	71
Wed	9:00 a.m.	32	9	13	16	18	9	25	57
Wed	10:00 a.m.	44	10	7	37	27	10	10	1
Wed	11:00 a.m.	56	19	14	16	30	19	0	0
Wed	12:00 p.m.	54	33	6	35	42	33	0	0
Wed	1:00 p.m.	25	24	2	28	14	24	0	0
Wed	2:00 p.m.	23	39	9	29	11	39	0	0
Wed	3:00 p.m.	31	40	13	63	18	40	25	32
Wed	4:00 p.m.	21	120	7	68	26	120	146	45
Wed	5:00 p.m.	10	113	1	121	11	113	111	64
Wed	6:00 p.m.	8	25	3	20	9	25	28	9
Wed	7:00 p.m.	6	45	2	7	11	45	19	11
Wed	8:00 p.m.	5	11	1	8	5	11	15	0
Wed	9:00 p.m.	0	4	1	3	2	4	5	1
Wed	10:00 p.m.	1	3	1	0	2	3	1	3
Wed	11:00 p.m.	13	9	3	3	9	9	9	7
Wed	12:00 a.m.	18	18	3	7	19	18	14	4
Thur	1:00 a.m.	0	0	1	2	0	0	7	8
Thur	2:00 a.m.	0	1	0	1	0	1	0	1

1996 and 1998 traffic survey data summary chart

DAY	TIME	May 1998 Portland/Jefferson		January 1996 Portland/Jefferson		May 1998 Portland/Lincoln		January 1996 Lincoln/Portland	
		West	East	West	East	West	East	South	North
Thur	3:00 a.m.	1	1	1	3	1	1	1	3
Thur	4:00 a.m.	1	2	1	1	0	2	2	1
Thur	5:00 a.m.	8	5	13	3	0	5	7	16
Thur	6:00 a.m.	17	17	22	11	1	22	16	21
Thur	7:00 a.m.	56	22	120	7	5	22	64	183
Thur	8:00 a.m.	23	15	21	12	4	15	26	38
Thur	9:00 a.m.	17	15	11	10	2	15	43	55
Thur	10:00 a.m.	14	21	13	9	2	21	45	47
Thur	11:00 a.m.	22	43	25	15	3	43	49	58
Thur	12:00 p.m.	13	41	12	18	3	41	32	56
Thur	1:00 p.m.	13	34	11	26	1	34	53	38
Thur	2:00 p.m.	20	42	6	21	3	42	58	52
Thur	3:00 p.m.	11	53	7	72	8	53	42	93
Thur	4:00 p.m.	9	150	9	86	22	150	121	78
Thur	5:00 p.m.	1	177	1	119	1	177	16	92
Thur	6:00 p.m.	3	18	1	16	1	18	29	9
Thur	7:00 p.m.	5	32	2	21	2	32	32	14
Thur	8:00 p.m.	0	10	1	21	1	10	31	4
Thur	9:00 p.m.	0	6	3	5	0	6	4	4
Thur	10:00 p.m.	0	2	0	7	0	2	8	1
Thur	11:00 p.m.	1	16	0	9	4	16	4	12
Thur	12:00 a.m.	0	7	0	12	1	7	22	6
Fri	1:00 a.m.	0	0	0	2	0	0	2	4
Fri	2:00 a.m.	0	0	0	1	0	0	4	3
Fri	3:00 a.m.	0	1	0	0	0	1	2	0
Fri	4:00 a.m.	0	0	0	4	0	0	0	0
Fri	5:00 a.m.	2	1	2	52	0	1	1	5
Fri	6:00 a.m.	4	9	15	83	0	9	0	125
Fri	7:00 a.m.	10	13	10	12	0	13	22	192
Fri	8:00 a.m.	0	3	3	3	0	3	7	24
Fri	9:00 a.m.	3	2	7	2	1	2	1	13
Fri	10:00 a.m.	4	8	3	8	0	8	2	13

Appendix C

Soil Transport Costs

Soil transport cost using existing route compared to a new haul road

1. Length of route:

Wilson Boulevard	19,556 ft
New Gravel Road	18,723 ft
Existing Route	35,815 ft

The transport distances are:

Via new gravel road:	$19,556 + 18,723 = 38,279$ feet = 7.25 miles
Via the existing roads:	$19,556 + 35,815 = 55,371$ feet = 10.5 miles

2. Assumptions

Case A: Using 21 yd³ truck via new gravel road

Assume that while the new gravel road is being built no other traffic will be interrupted. The route will have two stops, one at Jefferson Road and the other at a railroad crossing.

Average speed 35 MPH

Truck capacity 21 yd³

Loading and covering time of 8 minutes

Unloading 5 min. plus Rad checking equal to 15 minutes

Unloading use 10 trucks per hour, 8 hour per day, and 4 days per week

ICDF accepts only one truck at a time

Round trip time = $(7.25 * 2) / 35 * 60 + 8 + 15 = 48$ min. add 12 min idle time and use 60 min. per trip

8 hr. per day so each truck can have 8 trips per day.

Case B: Using 12-yd³ truck via the existing roads

There are three stops: at Jefferson Road, East Portland Avenue, and Lincoln Road.

Soil movement traffic is going to interact with public traffic.

Average speed 35 MPH

Truck capacity 12 yd³

Loading and covering time of 7 minutes

Unloading 5 min. plus Rad checking equal to 15 minutes

Unloading use 8 trucks per hour 8 hour per day, and 4 days per week

ICDF acceptance one truck at a time

Round trip time = $(10.5 * 2) / 35 * 60 + 7 + 15 = 58$ min., add 11 min. idle time and use 69 min. per trip

8 hr. per day so each truck can have 7 trips per day.

Case C: Using 21-yd³ truck via the existing roads

There are three stops: at Jefferson Road, East Portland Avenue, and Lincoln Road.

Soil movement traffic is going to interact with public traffic.

Average speed 35 MPH

Truck capacity 21 yd³

Loading and covering time of 8 minutes

Unloading 5 min. plus Rad checking equal to 15 minutes
 Unloading use 8 trucks per hour 8 hour per day, and 4 days per week
 ICDF acceptance one truck at a time
 Round trip time = $(10.5 * 2) / 35 * 60 + 8 + 15 = 59$ min., add 10 min. idle time and use 70 min. per trip
 8 hr. per day so each truck can have 7 trips per day.

3. Soil Movement Calculation Chart

Cases	No. & trip of truck per day	Truck-load per day	Volume moved per day (yd ³)	Working days need	Working weeks need
A	10 truck, 8 trips per truck per day	80	$80 \times 21 = 1680$	30 days	8 weeks
B	12 trucks, 7 trips per truck per day	84	$84 \times 12 = 1008$	50 days	13 weeks
C	12 trucks, 7 trips per truck per day	84	$84 \times 21 = 1764$	28 days	7 weeks

4. Cost comparison:

Assume the cost of loading and unloading for each cubic yard of soil to the two types of trucks is the same. Only soil transport cost to the trucks is different for the two routes. The 12 yd³ capacity truck costs \$31.45 per hour and the 21 yd³ capacity truck costs \$36.94 per hour.(truck + driver)

Case A unit cost = $(10 \times 8 \times \$36.94) / (1680 \text{ yd}^3) = \1.76 per yd^3 .
 Case A total transport cost = $50,000 \times \$1.76 = \$88,000$

Case B unit cost = $(12 \times 8 \times \$31.45) / (1008 \text{ yd}^3) = \3.00 per yd^3 .
 Case B total transport cost = $50,000 \times \$2.62 = \$150,000$

Case C unit cost = $(12 \times 8 \times \$36.94) / (1764 \text{ yd}^3) = \2.01 per yd^3 .
 Case C total transport cost = $50,000 \times \$2.01 = \$100,500$

5. Summary:

Without considering the cost of the safety factor and the cost of building the gravel road, the cost by using the different routes alone are as follows:

Case A versus Case B save approximately \$62,000
 Case A versus Case C will save approximately \$12,500

Appendix D

Archaeological Sites

Information regarding the location of cultural resources has been withheld from this document under the following authorities:

Archaeological Resources Protection Act of 1979 (as amended), Section 9
(16 USC 470hh, 43 CFR Part 7)

and

National Historic Preservation Act of 1966 (as amended), Section 304 (16
USC 470w-3, 36 CFR 800)

These laws provide for the distribution of sensitive locational information on a need-to-know basis. They override the U. S. Freedom of Information Act (5 USC 551) and thereby assure protection of the resources from theft, vandalism, and/or inadvertent destruction.

Appendix E

Cost Estimate

INTEROFFICE MEMORANDUM

Date: December 14, 1999

To: M. S. Spinti MS 3650 6-2545

From: J. C. Grenz JCG MS 3655 6-7175

Subject: WAG 5 ROAD POST ROD ARA II - JCG-06-99

Estimating Services has prepared a Planning estimate for the above subject project. This estimate includes construction directs, indirects, contingency, construction procurement support, Quality Assurance, Project Management, PIF, Procurement Fee and G&A.

Total Estimated Cost of the 200 station road \$1,100,000.00


Please refer to the attached Detail, Recapitulation, and Summary sheets for cost breakdowns, descriptions, and cost estimating bases.

If you have any questions or comment, please contact me at 526-7175.

JCG

Attachments

cc: Estimate File # 4952
J. C. Grenz File
W. S. Liu, MS 3954



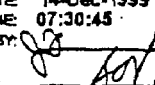
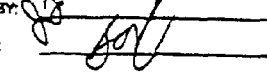
Bachtel BWXT Idaho, LLC

Rev. 10-96

PROJECT NAME: WAG 5 Road
Post Rod ARA II
LOCATION 1: CPP
REQUESTOR: M. S. Splint

COST ESTIMATE SUMMARY

TYPE OF ESTIMATE: Planning
PROJECT NO: 4962
PREPARED BY: J. C. Grenz
REPORT NAME: Cost Estimate Summary

DATE: 14-Dec-1999
TIME: 07:30:45
CHECKED BY: 
APPRO'D BY: 


WBS Element	Cost Estimate Element	Total Unescalated	Escalation	Total Incl Escalation
1.1	<u>ENGINEERING, DESIGN AND INSPECTION</u>			>> \$23,601
1.1.1	DESIGN ENGINEERING TITLE I & II	16,376	164	16,540
1.1.2	QUALITY ASSURANCE	6,789	272	7,061
1.2	<u>MANAGEMENT COSTS</u>			>> \$98,937
1.2.1	PROJECT MANAGEMENT	22,988	920	23,908
1.2.2	CONSTRUCTION MANAGEMENT	72,143	2,888	75,029
1.3	<u>CONSTRUCTION</u>			>> \$516,708
1.3.1	GENERAL CONDITIONS	22,083	883	22,966
1.3.2	SITWORK	474,762	18,990	493,742
1.5	<u>G&A/PIF</u>			>> \$165,786
1.5.1	G&A/PIF ADDER	159,410	6,376	165,786
1.5.2	PROCUREMENT FEES	17,389	696	>> \$18,085
	SUBTOTAL INCLUDING ESCALATION	791,930	31,187	>> \$823,117
	PROJECT CONTINGENCY			
	MANAGEMENT RESERVE			>> \$35,029
	CONTINGENCY			>> \$241,854
	TOTAL ESTIMATED COST			>> \$1,100,000

PROJECT COST PARAMETERS

EDI AS A % OF CONST. + GFE= 5.00%

CONTINGENCY= 33.64%

COST ESTIMATE SUPPORT DATA RECAPITULATION

Project Title: WAG 5 ROAD POST ROD ARA II
Estimator: J. C. Grenz
Date: December 14, 1999
Estimate Type: Planning
File: 4952
Approved By: 

I. **SCOPE OF WORK:** *Brief description of the proposed project.*

Construct road from ARA II Junction to the new ICDF at INTEC.

II. **BASIS OF THE ESTIMATE:** *Drawings, Design Report, Engineers Notes and/or other documentation upon which the estimate is originated.*

Road profile and typical section.

III. **ASSUMPTIONS:** *Conditions statements accepted or supposed true without proof of demonstration. An assumption has a direct impact on total estimated cost.*

1. Topsoil to be saved and placed on road shoulders for re-seeding.
2. Four culverts will be required for drainage.
3. Borrow for road fill can be obtained around INTEC.
4. Pit-run gravel can be obtained from the Lincoln Pit near TRA.
5. Very little training required for this clean road project.

IV. **CONTINGENCY GUIDELINE IMPLEMENTATION:** *The percentage used for contingency as determined by the contingency allowance guidelines can be altered to reflect the type of construction and conditions that may impact the total estimated cost.*

A 33.6% contingency has been used which falls within the estimating guidelines for a planning estimate.

V. **OTHER COMMENTS/CONCERNS SPECIFIC TO THE ESTIMATE**

1. A 12 foot roadway with no shoulders is far too narrow for 30 ton haul units.
2. The roadway should be lowered about 1.0 foot to get a better balance in the cut and fill quantities. Hauling all the borrow with trucks is much more expensive than working a short haul balanced cut and fill with scrapers.

Bachtel BWXT Idaho, LLC
 Rev 10-99
 PROJECT NAME: WAG 6 Road
 LOCATION 1: Post Rod ARA H
 REQUESTOR: CPP
 M. S. Spint

DETAILED COST ESTIMATE SHEET

PAGE # 1
 DATE 14-Dec-1999
 TIME 07:30:48
 REPORT NAME: Detail Cost Estimate Sheet

TYPE OF ESTIMATE: Planning
 PROJECT NO: 4952
 PREPARED BY: J. C. Grenz

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MATL	S/C (OTHER 1)	TOTAL COST
1.1.1 00101000	DESIGN ENGINEERING TITLE 1 & H Site Velocity Map	1	Drawing		Z-4130 BBW	4.000	4	288				288
	Civil Design including design, drafting, specification, calculations, reviews	4	Drawing		Z-4130 BBW	60.000	200	14,388				14,388
	Design Supervision @ 11.5%	1	Lot			0.000					1,700	1,700
	DESIGN ENGINEERING TITLE 1 & H S/T						204	\$14,876			\$1,700	\$19,376
1.1.2 00201000	QUALITY ASSURANCE Inspection and Overview	4	Wks		Z-7200 BBW	20.000	80	4,836				4,836
00203000	Vendor Data Review and Field Problems	4	Wks		Z-7200 BBW	2.000	8	494				494
00204000	QA/QC Document Control	4	Wks		Z-7200 BBW	2.000	8	494				494
00205000	Inspection Plan Preparation	4	Ea		Z-7200 BBW	1.000	4	247				247
	Quality Assurance Supervision @ 10%	1	Lot		BBW	0.000					620	620
	QUALITY ASSURANCE S/T						100	\$6,169			\$620	\$6,789
1.2.1	PROJECT MANAGEMENT											
	PROJECT MANAGEMENT S/T						0					
1.2.1.1	PROJECT MANAGEMENT Project Manager Cost	4	Wks		Z-8310 BBW	20.000	80	5,918				5,918

Bechtel BWXT Idaho, LLC
Rev 10-99

PROJECT NAME: WAG 5 Road
Post Rod ARA II
LOCATION 1: CPP
REQUESTOR: M. S. Spindt

DETAILED COST ESTIMATE SHEET

PAGE # 2

TYPE OF ESTIMATE: Planning
PROJECT NO.: 4982
PREPARED BY: J. C. Grenz

DATE 14-Dec-1999
TIME 07:30:48

REPORT NAME Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MATL	S/C (OTHER 1)	TOTAL COST
1.2.1.1	PROJECT MANAGEMENT Project Management - Management Support - 10% Of P.M. Total	1	Lot		BBW	0.000					592	592
	PROJECT MANAGEMENT S/T						80	\$5,918			\$592	\$6,510
1.2.1.2	COST ESTIMATING Cost Estimate - This E / AFC	1	Lot		Z-4330 BBW	30.000	30	1,843				1,843
	Cost Estimating Management Support - 14% Of Estimating Total	1	Lot		BBW	0.000					260	260
	COST ESTIMATING S/T						30	\$1,843			\$260	\$2,103
1.2.1.4	ENVIRONMENTAL SAFETY & HEALTH Environmental Safety & Health	4	Wks		Z-7120 BBW	20.000	80	4,938				4,938
	ES&H Management Support - 10% Of ES&H Total	1	Lot		BBW	0.000					490	490
	ENVIRONMENTAL SAFETY & HEALTH S/T						80	\$4,938			\$490	\$5,428
1.2.1.5	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Assemble Planning Team	1	Lot		Z-6310 BBW	10.000	10	740				740
	Initiate Work Control Form (WCF)	1	Es		Z-6310 BBW	4.000	4	296				296
	Update WCF (1 Hour / Day)	4	Wks		Z-6310 BBW	4.000	16	1,184				1,184
	Initiate Hazard Analysis Process	1	Lot		Z-6310 BBW	40.000	40	2,969				2,969
	Prepares Supporting Project Documents	1	Lot		Z-6310 BBW	30.000	30	2,219				2,219

Bechtel BWXT Idaho, LLC

Rev 10-99

PROJECT NAME: WAG 6 Road
 LOCATION 1: Post Rod ARA #
 REQUESTOR: CPP
 M. S. Spindl

DETAILED COST ESTIMATE SHEET

PAGE # 3

TYPE OF ESTIMATE: Planning
 PROJECT NO.: 4952
 PREPARED BY: J. C. Grenz

DATE 14-Dec-1999
 TIME 07:30:48
 REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MATL	S/C (OTHER 1)	TOTAL COST
1.2.1.1	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Post-Job Review	1	Es		Z-6310 BBW	10.000	10	740				740
	PM Management Support - 10% Of Total	1	Ltd		BBW	0.000					814	814
	PM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						110	\$8,137			\$814	\$8,951
1.2.2	CONSTRUCTION MANAGEMENT Construction Coordinator or Manager	4	Wks		Z-6340 BBW	20.000	80	8,918				8,918
00400200	Construction Engineer	4	Wks		Z-6340 BBW	40.000	160	11,836				11,836
00400400	ES&H	4	Wks		Z-6340 BBW	18.000	40	2,969				2,969
00400500	Quality	4	Wks		Z-6340 BBW	20.000	80	8,918				8,918
00401400	Pool Account (Direct Hours @ \$35/Per Hour)	1	Hours		Z-CFA BBW	360.000	360	14,400				14,400
	CONSTRUCTION MANAGEMENT S/T						720	\$41,029				\$41,029
1.2.2.1	GM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Initial Hazard Analysis Process	1	Ltd		Z-6340 BBW	10.000	10	740				740
	Assemble Planning Team	1	Ltd		Z-6340 BBW	60.000	60	3,699				3,699
	Develop Initial JSA & Input To Work Plans	1	Ltd		Z-6340 BBW	20.000	20	1,479				1,479
	Project Continuous Surveillance (2 Hours / Day)	4	Wks		Z-6340 BBW	8.000	32	2,387				2,387

Bechtel BWXT Idaho, LLC

Rev 10-99

PROJECT NAME: WAG 5 Road
 LOCATION 1: CPP
 REQUESTOR: M. S. Spintl

DETAILED COST ESTIMATE SHEET

TYPE OF ESTIMATE: Planning
 PROJECT NO: 4962
 PREPARED BY: J. C. Grenz

PAGE # 4

DATE 14-Dec-1999
 TIME 07:30:48
 REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MAT'L	SIC (OTHER 1)	TOTAL COST
1.2.2.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE Prepare Supporting Project Documents	1	Lot		Z-6340 BBW	26.000	26	1,849				1,849
	Develop Work Order	1	Lot		Z-6340 BBW	40.000	40	2,959				2,959
	Schedule Work On POO (1 Hour / Day)	4	Wks		Z-6340 BBW	4.000	16	1,184				1,184
	Subsurface Investigation (20 Hours / St)	4	Ea		Z-6340 BBW	20.000	80	5,918				5,918
00401400	Pool Account (Billed Hours @ \$35 Per Hour)	1	Hours		Z-CFA BBW	273.000	273	10,920				10,920
1.3.1	CM - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						546	\$31,114				\$31,114
	GENERAL CONDITIONS											
	GENERAL CONDITIONS S/T						0					
1.3.1.6	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE ---GENERAL CONTRACTOR---											
	Walk-about	4	Wks		LABR GEN	2.000	8	241				241
	Post Job Review	1	Lot		SUPR GEN	10.000	10	400				400
	GC - CONDUCT OF OPERATIONS / CONDUCT OF MAINTENANCE S/T						18	\$841				\$841

Bechtel/BWXT Idaho, LLC

Rev 10-99

PROJECT NAME: WAG 6 Road
Post Rod ARA II
LOCATION 1: CPP
REQUESTOR: M. S. Spindl

DETAILED COST ESTIMATE SHEET

PAGE # 5

TYPE OF ESTIMATE: Planning

PROJECT NO.: 4952

PREPARED BY: J. C. Grenz

DATE: 14-Dec-1999

TIME: 07:30:48

REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MATL	S/C (OTHER 1)	TOTAL COST
1.1.1.2	GENERAL PROJECT COSTS SUPERVISION	4	Wks		SUPR GEN	40.000	160	6,400				6,400
	MORDEMOB	1			GEN	0.000					10,000	10,000
	GENERAL PROJECT COSTS S/T						160	6,400			\$10,000	\$16,400
1.3.2	SITEWORK											
	SITEWORK S/T						0					
1.3.2.1	Clear & Grub Clear Brush	140	ac		GEN	0.000		1,203	2,649		36	3,888
	Strip Topsoil	11,100	cy		GEN	0.000		1,554	3,552			5,106
	Replace Topsoil	11,100	cy		GEN	0.000		3,108	7,104		222	10,434
	Seed area	140	ac		GEN	0.000					140,000	140,000
	Clear & Grub S/T						0	6,866	\$13,305		\$140,288	\$159,428
1.3.2.2	Common Fill Doxe Cut to Fill	100	cy		GEN	0.000		80	177		2	259
	Haul Borrow to Fill	18,970	cy		GEN	0.000		28,511	34,540		747	61,788
	Spread and Compact Fill	18,770	cy		GEN	0.000		20,847	27,592		503	48,802
	Initial CMP	100	lf	12.50	GEN	0.000		500	105	1,250	100	1,955
	Common Fill S/T						0	\$47,738	\$82,413	\$1,250	\$1,412	\$112,814

Bechtel BWXT Idaho, LLC

Rev 10-99

PROJECT NAME: WAG & Road
Post Rod AREA II
LOCATION 1: CPP
REQUESTOR: M. S. Splint

DETAILED COST ESTIMATE SHEET

TYPE OF ESTIMATE: Planning
PROJECT NO: 4882
PREPARED BY: J. C. Grenz

PAGE # 0

DATE 14-Dec-1999
TIME: 07:30:48
REPORT NAME: Detail Cost Estimate Sheet

CODE	DESCRIPTION	QTY	UOM	MATL UNIT COST	CREW SUB	UNIT LAB HOURS	TOTAL LAB HRS	LABOR	CONST. EQUIP.	MATL	S/C (OTHER 1)	TOTAL COST
1.3.2.3	Gravel Road Bed Hard Gravel to Fill	15,570	CY		GEN	0.000		23,511	31,140		779	55,429
	Spread and Compact Gravel	15,570	CY		GEN	0.000		16,348	21,798		487	38,614
	Gravel Road Bed S/T						0	\$39,859	\$52,938		\$1,246	\$94,043
1.5.1	G&A/PIF ADDER Construction GSA - Year One	1	Lt		BBW	0.000					138,941	138,941
	Performance Incentive Factor (PIF) - Year One	1	Lt		BBW	0.000					20,569	20,569
	G&A/PIF ADDER S/T						0				\$169,410	\$169,410
	PROJECT SUBTOTAL						2.048	\$214,323	\$128,886	\$1,280	\$316,802	\$661,031

Technical BWXT Idaho, LLC

PROJECT: WAG 6 Road
 LOCATION: Post Red ARA II
 ESTIMATOR: CPP
 CLIENT: J. C. Grenz
 M. S. Spindl

CONTRACTOR MARKUP DISTRIBUTION REPORT

DATE: December 14, 1999
 ESTTYPE: Planning
 PROJECT NO: 4952

CONTRACTOR	LABOR HOURS	LABOR	MATERIAL	EQUIPMENT	OTHERS	SUBTOTAL	% MARKUP	% DIRECT COST	% TOTAL COST
PRIME CONTRACTOR	0	\$0	\$0	\$0	\$0	\$0	0.00%	0.00%	0.00%
TOTAL FOR PRIME CONTRACTOR		\$0	\$0	\$0	\$0	\$0	0.00%	0.00%	0.00%
GENERAL CONTRACTOR - GEN									
PROFIT		\$100,503	\$1,313	\$128,658	\$152,918	\$383,388	100.00%	100.00%	77.17%
OVERHEADS		\$10,050	\$131	\$12,888	\$15,292	\$38,339	10.00%		
		\$5,528	\$72	\$7,076	\$8,410	\$21,086	5.50%		
TOTAL FOR GENERAL CONTRACTOR - GEN	178	\$116,081	\$1,516	\$148,598	\$176,618	\$442,813	15.50%		
TOTAL DIRECT COST	178	\$100,503	\$1,313	\$128,658	\$152,918	\$383,388	100.00%		
TOTAL SUBCONTRACTOR MARKUPS		\$16,578	\$203	\$19,842	\$23,702	\$59,428			11.96%
TOTAL COST TO PRIME		\$116,081	\$1,516	\$148,598	\$176,618	\$442,813			
PRIME CONTRACTOR MARKUP		\$14,182	\$186	\$18,129	\$21,847	\$54,023			10.87%
TOTAL PROJECT COST		\$130,243	\$1,701	\$166,727	\$198,165	\$496,836			

G & A and PIF Worksheet

Project: WAG 5 Road

Estimate No.: 4952

Estimator: J. C. Grenz

Date: 12/14/99

Total Construction Cost	\$	496,835
Construction Procurement Fee-3.5%	\$	17,389
Total GFE Cost	\$	-
GFE Procurement Fee - 3.5%	\$	-

Construction Cost

Construction Cost - Year 1	\$	496,835	
GFE Cost - Year 1	\$	-	
Subtotal	\$	496,835	\$ 496,835

G & A @ 27% With A \$500,000 Construction Ceiling (\$135,000)

		G & A	Amount	
Construction Cost - Year 1	\$	496,835	27%	\$ 134,145
Procurement Cost	\$	17,389	27%	\$ 4,695
GFE Cost - Year 1	\$	-	27%	\$ -
GFE Procurement Cost	\$	-	27%	\$ -
Subtotal				\$ 138,841

Performance Incentive Factor (PIF) @ 4% - No Ceiling

		PIF		
Construction Cost - Year 1	\$	496,835	4.0%	\$ 19,873
Procurement Cost	\$	17,389	4.0%	\$ 696
GFE Cost - Year 1	\$	-	4.0%	\$ -
GFE Procurement Cost	\$	-	4.0%	\$ -
Subtotal				\$ 20,569

Total Adders \$ **\$ 159,410**

Total Cost **\$ 656,245**

Total Adder % **32%**

CONTINGENCY ANALYSIS

PROJECT NAME: WAG 5 Road
Post Rod ARA II
LOCATION: CPP
REQUESTOR: M. S. Splint

TYPE OF ESTIMATE: Planning
PROJECT NO: 4362
PREPARED BY: J. C. Grenz

DATE: 14-Dec-1999
TIME: 07:30:16

REPORTNAME: Contingency Analysis

PROBABLE % VARIATION									PROJECT CONTINGENCY		SUMMARY
WBS Element	Cost Estimate Element	Total Cost w/o Contingency	% Total Cost	Prob. % Var. From Est.		Wt. % of Prob.		Contingency	%	Cost	Total Cost by Element
				-	+	-	+				
1.1.1	DESIGN ENGINEERING TITLE I & II	18,378	1.39	20	30	0.40	0.60	0.437%	1.48%	4,099	22,477
1.1.2	QUALITY ASSURANCE	6,788	0.82	20	30	0.18	0.28	0.206%	0.81%	1,639	8,427
1.2.1	PROJECT MANAGEMENT	22,988	2.79	20	30	0.56	0.84	0.636%	2.08%	6,764	29,742
1.2.2	CONSTRUCTION MANAGEMENT	72,143	8.76	20	30	1.78	2.63	2.191%	8.52%	18,068	90,191
1.3.1	GENERAL CONDITIONS	22,083	2.68	20	30	0.54	0.80	0.671%	2.00%	5,527	27,610
1.3.2	SITEWORK	474,782	57.68	20	30	11.54	17.38	14.419%	42.51%	118,823	593,577
1.5.1	GA/APF ADDER	189,410	19.37	20	30	3.87	5.81	4.842%	14.41%	33,898	223,308
1.5.2	PROCUREMENT FEES	17,389	2.11	20	30	0.42	0.63	0.528%	1.87%	4,362	21,741
	ESCALATION	31,187	3.79	20	20	0.76	0.76	0.806%	1.80%	7,878	109,86
SUBTOTAL		823,117	100.00					24.683%			
CALCULATED CONTINGENCY		202,972									
RESULTANT TEC		1,026,089									
ROUNDED TEC		1,100,000									
PROJECT CONTINGENCY		278,883						33.64%			
MANAGEMENT RESERVE		38,029									
CONTINGENCY		241,854									
TOTAL ESTIMATED COST		1,100,000								278,883	1,100,000

CONFIDENCE LEVEL AND ASSUMED RISKS:

The Bechtel BWXT Idaho, LLC Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90 % probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE

Guidelines established by DOE/FM 50, Cost Estimating Guide, Vol. 8, Cost Guide, and as presented in the INEEL Cost Estimating Guide.

PLANNING 20% - 30%

Experimental/Special Conditions Up to 50%

Conceptual 15% - 25%

Experimental/Special Conditions Up to 40%

TITLE I 10% - 20%

TITLE II 5% - 15%

TITLE II/AFC Market Conditions